



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 1 No. 1 Boiler
4. EQUIPMENT MANUFACTURER'S INFORMATION:
MANUFACTURER'S NAME BABCOCK & WILCOX RATED CAPACITY - MAXIMUM INPUT 180,000,000
(BTU/hr.)
EQUIPMENT MODEL NUMBER NOT APPLICABLE
5. PURPOSE (If multipurpose, note percent in each use category.)
SPACE HEAT _____ POWER GENERATION 7%
PROCESS HEAT* 93% OTHER (Specify) _____
6. TYPE OF COMBUSTION UNIT:

<p>A. COAL</p> <p><input type="checkbox"/> PULVERIZED</p> <p><input type="checkbox"/> General</p> <p><input type="checkbox"/> Dry Bottom</p> <p><input type="checkbox"/> Wet Bottom With Fly Ash Reinjection</p> <p><input type="checkbox"/> Wet Bottom Without Fly Ash Reinjection</p>	<p><input type="checkbox"/> SPREADER STOKER</p> <p><input type="checkbox"/> With Fly Ash Reinjection</p> <p><input type="checkbox"/> Without Fly Ash Reinjection</p> <p><input type="checkbox"/> CYCLONE</p> <p><input type="checkbox"/> HAND FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>	<p>B. FUEL OIL AND GAS</p> <p><input checked="" type="checkbox"/> HORIZONTALLY FIRED</p> <p><input type="checkbox"/> TANGENTIALLY FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>
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7. NORMAL SCHEDULE OF OPERATION:

HOURS PER DAY <u>24</u>	WEEKS PER YEAR <u>52</u>
DAYS PER WEEK <u>7</u>	PEAK SEASON <u>Aug, Sept, Oct</u> (Specify Months of Year)
TOTAL HOURS PER YEAR <u>8760</u>	

* Process Heat Includes
 Steam Stripping
 Steam Tracing
 Space Heating
 Turbine Driving
 Cat. Carrier Steam
 Regenerator Smothering Steam
 Cyclone Interstage Steam
 Bleed Steam

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR 1976
(Specify Year)

	PRIMARY FUEL		STANDBY FUEL	
	Type <u>GAS</u>		Type <u>OIL</u>	
	Quantity per year <u>423.5 MMSCF</u> (Specify Units)		Quantity per year <u>104,715 Bbl</u> (Specify Units)	
	Delivered Cost of fuel <u>\$1.89/1000 SCF</u> (\$/Unit Quantity)		Delivered Cost of fuel <u>\$12.76/Bbl</u> (\$/Unit Quantity)	
PERCENT ASH (Solid Fuel Only)			Wt %	
Max.	-		0.070	
Min.	-		0.004	
Avg.	-		0.017	
PERCENT SULFUR			Wt %	
Max.	Wt % <u>2.74</u>		<u>2.48</u>	
Min.	<u>0.28</u>		<u>1.08</u>	
Avg.	<u>1.43</u>		<u>1.66</u>	
BTU PER UNIT (Specify)	<u>BTU/SCF</u>	<u>Mol Wt</u>	<u>BTU/Bbl</u>	<u>°API</u>
Max.	<u>946</u>	<u>19.38</u>	<u>6,080,000</u>	<u>9.00</u>
Min.	<u>824</u>	<u>19.23</u>	<u>5,910,000</u>	<u>15.60</u>
Avg.	<u>890</u>	<u>19.30</u>	<u>6,020,000</u>	<u>11.26</u>

9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL	STANDBY FUEL	MONTH	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u>	Type <u>OIL</u>		Type <u>GAS</u>	Type <u>OIL</u>
	Units <u>MMBTU</u>	Units <u>MMBTU</u>		Units <u>MMBTU</u>	Units <u>MMBTU</u>
Jan.	23,435	53,852	July	42,588	55,975
Feb.	21,034	51,942	Aug.	48,599	52,899
March	18,428	55,236	Sept.	46,369	48,399
April	22,943	39,790	Oct.	36,728	67,543
May	30,300	45,306	Nov.	21,590	49,049
June	44,068	51,758	Dec.	20,912	58,636

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>OIL</u> Units <u>MMBTU</u>
Maximum	87	103
Average	43	72

11. COMBUSTION AIR

☐ NATURAL DRAFT☒ INDUCED☒ FORCED PRESSURE 0.04
(lbs./sq.in.)OTHER _____
(Specify)

12. STACK DATA

HEIGHT ABOVE GRADE 100
(feet)GAS TEMPERATURE AT EXIT 331
(degrees F. average)INSIDE DIAMETER AT EXIT 5.5
(feet)GAS VELOCITY AT EXIT 32.2
(feet per sec. average)EXIT GAS FLOW RATE, SCFM: AVERAGE 26,760 MAXIMUM 44,611ARE SAMPLING PORTS AVAILABLE? Yes ☐ No ☒ (If "Yes" describe)

13. DESCRIBE FUEL TRANSPORT AND STORAGE METHODS:

FUEL OIL

Transport: Pumped thru pipeline to Power Station

Storage: Cone roof tanks

FUEL GAS

Transport: Pressured thru pipeline to Power Station

Storage: None

14. IS ANY AIR CONTAMINANT CONTROL DEVICE USED IN CONJUNCTION WITH THIS EQUIPMENT? Yes
- ☐
- No
- ☒
-
- (If "Yes" a "GAS CLEANING EQUIPMENT," Form AP 109, must be completed and attached.)

15. STACK EMISSIONS:

POLLUTANT	QUANTITY	
	Pounds Per Hour (Average)	Tons Per Year
Particulate	O 0.7	3.08
Sulfur Dioxide	O 218	927
Nitrogen Oxides	E 71.64	314
Carbon Monoxide	O 0	0
Other (Specify)	-	-

BASIS FOR QUANTITIES LISTED ABOVE: O = FLUE GAS ORSAT & FUEL ANALYSIS

E = ESTIMATED - AIR POLLUTION ENGINEERING MANUAL, USEPA AP-40 2ND ED.

16. IS THIS ITEM IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS? Yes
- ☒
- No
- ☐
-
- (If "No" a "COMPLIANCE SCHEDULE," Form AP 110 must be completed and attached.)

NAME OF PERSON SUBMITTING REPORT HERBERT F. SIMONS TITLE TECHNICAL SUPERINTENDENTSIGNATURE Herbert F. SimonsDATE 2-17-77PHONE 663-7418



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN N.D.
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 2 No. 2 Boiler
4. EQUIPMENT MANUFACTURER'S INFORMATION:
MANUFACTURER'S NAME BABCOCK & WILCOX RATED CAPACITY - MAXIMUM INPUT 180,000,000
(BTU/hr.)
EQUIPMENT MODEL NUMBER NOT APPLICABLE
5. PURPOSE (If multipurpose, note percent in each use category.)
SPACE HEAT _____ POWER GENERATION 7%
* PROCESS HEAT 93% OTHER (Specify) _____
6. TYPE OF COMBUSTION UNIT:
A. COAL
☐ PULVERIZED ☐ SPREADER STOKER
☐ General ☐ With Fly Ash Reinjection
☐ Dry Bottom ☐ Without Fly Ash Reinjection
☐ Wet Bottom With Fly Ash Reinjection ☐ CYCLONE
☐ Wet Bottom Without Fly Ash Reinjection ☐ HAND FIRED
☐ OTHER (Specify) _____
B. FUEL OIL AND GAS
☒ HORIZONTALLY FIRED
☐ TANGENTIALLY FIRED
☐ OTHER (Specify) _____
7. NORMAL SCHEDULE OF OPERATION:
HOURS PER DAY 24 WEEKS PER YEAR 52
DAYS PER WEEK 7 PEAK SEASON AUG, SEPT, OCT,
TOTAL HOURS PER YEAR 8760 (Specify Months of Year)
- * Process Heat Includes:
Steam Stripping
Steam Tracing
Space Heating
Turbine Driving
Cat. Carrier Steam
Regenerator Smothering Steam
Cyclone Interstage Steam
Bleed Steam

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR

1976

(Specify Year)

	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Quantity per year <u>423.5 MMSCF</u> (Specify Units) Delivered Cost of fuel <u>\$1.89/1000 SCF</u> (\$/Unit Quantity)	Type <u>OIL</u> Quantity per year <u>104,715 Bbl</u> (Specify Units) Delivered Cost of fuel <u>\$12.76/Bbl</u> (\$/Unit Quantity)
PERCENT ASH (Solid Fuel Only) Max. Min. Avg.	- - -	Wt % 0.070 0.004 0.017
PERCENT SULFUR Max. Min. Avg.	Wt % 2.74 0.28 1.43	Wt % 2.46 1.08 1.66
BTU PER UNIT (Specify) Max. Min. Avg.	BTU/SCF 946 824 890	MOL WT 19.38 19.23 19.30
		BTU/Bbl 6,080,000 5,910,000 6,020,000
		API 9.00 15.60 11.26

9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR

1976

(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL	STANDBY FUEL	MONTH	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>OIL</u> Units <u>MMBTU</u>		Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>GAS</u> Units <u>MMBTU</u>
Jan.	23,435	53,852	July	42,588	55,975
Feb.	21,034	51,942	Aug.	48,599	52,899
March	18,428	55,236	Sept.	46,369	48,399
April	22,943	39,790	Oct.	36,728	67,543
May	30,300	45,306	Nov.	21,590	49,049
June	44,068	51,758	Dec.	20,912	58,636

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR

1976

(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>OIL</u> Units <u>MMBTU</u>
Maximum	87	103
Average	43	72

11. COMBUSTION AIR

☐ NATURAL DRAFT ☒ INDUCED ☒ FORCED PRESSURE 0.04 OTHER _____
(lbs./sq.in.) (Specify)

12. STACK DATA

HEIGHT ABOVE GRADE 100 GAS TEMPERATURE AT EXIT 331
(feet) (degrees F. average)

INSIDE DIAMETER AT EXIT 5.5 GAS VELOCITY AT EXIT 32.2
(feet) (feet per sec. average)

EXIT GAS FLOW RATE, SCFM: AVERAGE 26,760 MAXIMUM 44,611

ARE SAMPLING PORTS AVAILABLE? Yes ☐ No ☒ (If "Yes" describe)

13. DESCRIBE FUEL TRANSPORT AND STORAGE METHODS:

FUEL OIL

Transport: Pumped thru pipeline
Storage: Cone roof tanks

FUEL GAS

Transport: Pressured thru pipeline
Storage: None

14. IS ANY AIR CONTAMINANT CONTROL DEVICE USED IN CONJUNCTION WITH THIS EQUIPMENT? Yes ☐ No ☒
(If "Yes" a "GAS CLEANING EQUIPMENT," Form AP 109, must be completed and attached.)

15. STACK EMISSIONS:

POLLUTANT	QUANTITY	
	Pounds Per Hour (Average)	Tons Per Year
Particulate	0.770	3.08
Sulfur Dioxide	218	927
Nitrogen Oxides	71.64	314
Carbon Monoxide	0	0
Other (Specify)	-	-

BASIS FOR QUANTITIES LISTED ABOVE: O = FLUE GAS ORSAT & FUEL ANALYSIS
E = ESTIMATED-AIR POLLUTION ENGINEERING MANHOURS
US EPA AP-40 2ND ED

16. IS THIS ITEM IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS? Yes ☒ No ☐
(If "No" a "COMPLIANCE SCHEDULE," Form AP 110 must be completed and attached.)

NAME OF PERSON SUBMITTING REPORT HERBERT E. SIMONS TITLE TECHNICAL SUPERINTENDENT

SIGNATURE Herbert E. Simons

DATE 2/17/77 PHONE 663-7418



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 3 No. 3 Boiler
4. EQUIPMENT MANUFACTURER'S INFORMATION:

MANUFACTURER'S NAME BABCOCK & WILCOX RATED CAPACITY - MAXIMUM INPUT 175,000,000
(BTU/hr.)

EQUIPMENT MODEL NUMBER NOT APPLICABLE

5. PURPOSE (If multipurpose, note percent in each use category.)

SPACE HEAT _____ POWER GENERATION 7%

- * PROCESS HEAT 93% OTHER (Specify) _____

6. TYPE OF COMBUSTION UNIT:

A. COAL

☐ PULVERIZED

☐ SPREADER STOKER

☐ General

☐ With Fly Ash
Reinjection

☐ Dry Bottom

☐ Without Fly Ash
Reinjection

☐ Wet Bottom
With Fly Ash
Reinjection

☐ CYCLONE

☐ Wet Bottom
Without Fly Ash
Reinjection

☐ HAND FIRED

☐ OTHER (Specify) _____

B. FUEL OIL & GAS

☒ HORIZONTALLY FIRED

☐ TANGENTIALLY FIRED

☐ OTHER (Specify) _____

7. NORMAL SCHEDULE OF OPERATION:

HOURS PER DAY 24

WEEKS PER YEAR 24

DAYS PER WEEK 7

PEAK SEASON DEC, JAN, FEB.
(Specify Months of Year)

TOTAL HOURS PER YEAR 4104

- * Process Heat Includes

Steam Stripping

Steam Tracing

Space Heating

Turbine Driving

Cat Carrier Steam

Regenerator Smothering Steam

Cyclone Interstage Steam

Blced Steam

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR 1976
(Specify Year)

	PRIMARY FUEL		STANDBY FUEL	
	Type	GAS	Type	OIL
	Quantity		Quantity	
	per year	132.4 MM SCF (Specify Units)	per year	49.791 Bbl (Specify Units)
	Delivered Cost of fuel	\$ 1.89/1000 SCF (\$/Unit Quantity)	Delivered Cost of fuel	\$12.76/Bbl (\$/Unit Quantity)
PERCENT ASH (Solid Fuel Only)			Wt. %	
Max.	-		0.070	
Min.	-		0.004	
Avg.	-		0.017	
PERCENT SULFUR			Wt. %	
Max.	Wt. %		2.74	
Min.	0.28		1.08	
Avg.	1.43		1.66	
BTU PER UNIT (Specify)	BTU/SCF	MOL WT	BTU/Bbl	°API
Max.	946	19.38	6,080,000	9.00
Min.	824	19.23	5,910,000	15.60
Avg.	890	19.30	6,020,000	11.26

9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL		MONTH	STANDBY FUEL	
	Type	GAS		Type	OIL
	Units	MMBTU		Units	MMBTU
Jan.	23,435		July	-	-
Feb.	21,034		Aug.	-	-
March	18,428		Sept.	-	-
April	9,920		Oct.	2,448	4,502
May	-		Nov.	21,590	49,049
June	-		Dec.	20,912	58,636

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL
	Type GAS Units MMBTU	Type OIL Units MMBTU
Maximum	31.5	78.8
Average	25.7	73.0

11. COMBUSTION AIR

☐ NATURAL DRAFT ☒ INDUCED ☒ FORCED PRESSURE 0.04 OTHER _____
(lbs./sq.in.) (Specify)

12. STACK DATA

HEIGHT ABOVE GRADE 100 GAS TEMPERATURE AT EXIT 338
(feet) (degrees F. average)

INSIDE DIAMETER AT EXIT 6.17 GAS VELOCITY AT EXIT 22.2
(feet) (feet per sec. average)

EXIT GAS FLOW RATE, SCFM: AVERAGE 23,300 MAXIMUM 44,305

ARE SAMPLING PORTS AVAILABLE? Yes ☐ No ☒ (If "Yes" describe)

13. DESCRIBE FUEL TRANSPORT AND STORAGE METHODS:

FUEL OIL

Transport: Pumped thru pipeline to Power Station
Storage: Cone roof tanks

FUEL GAS

Transport: Pressured thru pipeline to Power Station
Storage: None

14. IS ANY AIR CONTAMINANT CONTROL DEVICE USED IN CONJUNCTION WITH THIS EQUIPMENT? Yes ☐ No ☒
(If "Yes" a "GAS CLEANING EQUIPMENT," Form AP 109, must be completed and attached.)

15. STACK EMISSIONS:

POLLUTANT	QUANTITY	
	Pounds Per Hour (Average)	Tons Per Year
Particulate	O 0.7	1.47
Sulfur Dioxide	O 189	388
Nitrogen Oxides	E 67	138
Carbon Monoxide	O 0	0
Other (Specify)	-	-

BASIS FOR QUANTITIES LISTED ABOVE: O = FLUE GAS ORSAT & FUEL ANALYSIS
E = ESTIMATED-AIR POLLUTION ENGINEERING MANUAL
US EPA AP-40 2ND ED.

16. IS THIS ITEM IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS? Yes ☒ No ☐
(If "No" a "COMPLIANCE SCHEDULE," Form AP 110 must be completed and attached.)

NAME OF PERSON SUBMITTING REPORT HERBERT E. SIMONS TITLE TECHNICAL SUPERINTENDENT

SIGNATURE Herbert E. Simons

DATE 2-18-77 PHONE 663-7418



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 4 Crude Furnace
4. EQUIPMENT MANUFACTURER'S INFORMATION:
MANUFACTURER'S NAME LUMMUS RATED CAPACITY - MAXIMUM INPUT 158,130,000
(BTU/hr.)
EQUIPMENT MODEL NUMBER NOT APPLICABLE
5. PURPOSE (If multipurpose, note percent in each use category.)
SPACE HEAT _____ POWER GENERATION _____
PROCESS HEAT 100% OTHER (Specify) _____
6. TYPE OF COMBUSTION UNIT:

<p>A. COAL</p> <p><input type="checkbox"/> PULVERIZED</p> <p><input type="checkbox"/> General</p> <p><input type="checkbox"/> Dry Bottom</p> <p><input type="checkbox"/> Wet Bottom With Fly Ash Reinjection</p> <p><input type="checkbox"/> Wet Bottom Without Fly Ash Reinjection</p>	<p><input type="checkbox"/> SPREADER STOKER</p> <p><input type="checkbox"/> With Fly Ash Reinjection</p> <p><input type="checkbox"/> Without Fly Ash Reinjection</p> <p><input type="checkbox"/> CYCLONE</p> <p><input type="checkbox"/> HAND FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>	<p>B. FUEL OIL AND GAS</p> <p><input checked="" type="checkbox"/> HORIZONTALLY FIRED</p> <p><input type="checkbox"/> TANGENTIALLY FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>
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7. NORMAL SCHEDULE OF OPERATION:

HOURS PER DAY <u>24</u>	WEEKS PER YEAR <u>52</u>
DAYS PER WEEK <u>7</u>	PEAK SEASON <u>*December</u> (Specify Months of Year)
TOTAL HOURS PER YEAR <u>8760</u>	

Firing rate is related to crude run and ambient temperature.
Highest firing rate occurred in Dec 1976.

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR

1976

(Specify Year)

	PRIMARY FUEL		STANDBY FUEL	
	Type	<u>GAS</u>	Type	<u>OIL</u>
	Quantity	<u>837 MMSCF</u>	Quantity	<u>69,216 Bbl</u>
	per year	(Specify Units)	per year	(Specify Units)
	Delivered Cost	<u>\$1.77/1000 SCF</u>	Delivered Cost	<u>\$12.76/Bbl</u>
	of fuel	(\$/Unit Quantity)	of fuel	(\$/Unit Quantity)
PERCENT ASH (Solid Fuel Only)			Wt %	
Max.	-		0.070	
Min.	-		0.004	
Avg.	-		0.017	
PERCENT SULFUR		Wt %		Wt %
Max.		<u>5.89</u>		<u>2.46</u>
Min.		<u>2.61</u>		<u>1.08</u>
Avg.		<u>4.25</u>		<u>1.66</u>
BTU PER UNIT (Specify)	BTU/SCF	Mol Wt	BTU/Bbl	°API
Max.	<u>952</u>	<u>22.5</u>	<u>6,080,000</u>	<u>9.00</u>
Min.	<u>715</u>	<u>18.5</u>	<u>5,910,000</u>	<u>15.60</u>
Avg.	<u>834</u>	<u>20.3</u>	<u>6,020,000</u>	<u>11.29</u>

9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR

1976

(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL	STANDBY FUEL	MONTH	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u>	Type <u>OIL</u>		Type <u>GAS</u>	Type <u>OIL</u>
	Units <u>MMBTU</u>	Units <u>MMBTU</u>		Units <u>MMBTU</u>	Units <u>MMBTU</u>
Jan.	54,014	48,060	July	62,292	29,514
Feb.	55,390	41,581	Aug.	64,344	33,281
March	48,500	41,864	Sept.	64,994	32,314
April	48,158	39,105	Oct.	67,432	34,979
May	50,507	41,324	Nov.	61,281	39,986
June	55,596	36,122	Dec.	65,145	43,551

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR

1976

(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u>	Type <u>OIL</u>
	Units <u>MMBTU</u>	Units <u>MMBTU</u>
Maximum	87.6	64.6
Average	79.4	52.6

11. COMBUSTION AIR

☒ NATURAL DRAFT ☐ INDUCED ☐ FORCED PRESSURE _____ (lbs./sq.in.) OTHER _____ (Specify)

12. STACK DATA

HEIGHT ABOVE GRADE 124 (feet) GAS TEMPERATURE AT EXIT 864°F (degrees F. average)

INSIDE DIAMETER AT EXIT 7.25 (feet) GAS VELOCITY AT EXIT 30 (feet per sec. average)

EXIT GAS FLOW RATE, SCFM: AVERAGE 28,334 MAXIMUM 31,339

ARE SAMPLING PORTS AVAILABLE? Yes ☐ No ☒ (If "Yes" describe)

13. DESCRIBE FUEL TRANSPORT AND STORAGE METHODS:

OIL: Fuel Oil is stored in cone roof tanks and pumped thru pipeline to furnace.

GAS: Gas is pressured to furnace - there is no gas storage.

14. IS ANY AIR CONTAMINANT CONTROL DEVICE USED IN CONJUNCTION WITH THIS EQUIPMENT? Yes ☐ No ☒
(If "Yes" a "GAS CLEANING EQUIPMENT," Form AP 109, must be completed and attached.)

15. STACK EMISSIONS:

POLLUTANT	QUANTITY	
	Pounds Per Hour (Average)	Tons Per Year
Particulate	O 0.46	2.04
Sulfur Dioxide	O 553.	2429
Nitrogen Oxides	E 37	161
Carbon Monoxide	O 0	0
Other (Specify)	-	-

BASIS FOR QUANTITIES LISTED ABOVE: O = FROM ORSAT AND FUEL ANALYSIS

E = ESTIMATED FROM USEPA AIR POLLUTION ENGINEERING MANUAL
AP-40 2ND ED.

16. IS THIS ITEM IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS? Yes ☒ No ☐
(If "No" a "COMPLIANCE SCHEDULE," Form AP 110 must be completed and attached.)

NAME OF PERSON SUBMITTING REPORT HERBERT E. SIMONS TITLE TECHNICAL SUPERINTENDENT

SIGNATURE Herbert E. Simons

DATE Feb. 22, 1977

PHONE 663-7418

* SO₂ emissions are 4.19 lb/MMBTU for this furnace, however it is one of 6 fuel burning devices located in close proximity under control of the same person.



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL CO
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 5 Ultraformer F-100
4. EQUIPMENT MANUFACTURER'S INFORMATION:
MANUFACTURER'S NAME BORN ENGINEERING CO RATED CAPACITY - MAXIMUM INPUT 19,000,000
(BTU/hr.)
EQUIPMENT MODEL NUMBER NO APPLICABLE
5. PURPOSE (If multipurpose, note percent in each use category.)
SPACE HEAT _____ POWER GENERATION _____
PROCESS HEAT 100% OTHER (Specify) _____
6. TYPE OF COMBUSTION UNIT:

<p>A. COAL</p> <p><input type="checkbox"/> PULVERIZED</p> <p><input type="checkbox"/> General</p> <p><input type="checkbox"/> Dry Bottom</p> <p><input type="checkbox"/> Wet Bottom With Fly Ash Reinjection</p> <p><input type="checkbox"/> Wet Bottom Without Fly Ash Reinjection</p>	<p><input type="checkbox"/> SPREADER STOKER</p> <p><input type="checkbox"/> With Fly Ash Reinjection</p> <p><input type="checkbox"/> Without Fly Ash Reinjection</p> <p><input type="checkbox"/> CYCLONE</p> <p><input type="checkbox"/> HAND FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>	<p>B. SOLID FUEL GAS</p> <p><input type="checkbox"/> HORIZONTALLY FIRED</p> <p><input type="checkbox"/> TANGENTIALLY FIRED</p> <p><input checked="" type="checkbox"/> OTHER (Specify) <u>VERTICALLY FIRED</u></p>
---	---	--
7. NORMAL SCHEDULE OF OPERATION:

<p>HOURS PER DAY <u>24</u></p> <p>DAYS PER WEEK <u>7</u></p> <p>TOTAL HOURS PER YEAR <u>8760</u></p>	<p>WEEKS PER YEAR <u>52</u></p> <p>PEAK SEASON <u>March</u> (Specify Months of Year)</p>
--	--

The heat demand from this furnace is created by feed rate more than by ambient conditions - The highest feed rate was observed in March, 1976.

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR 1976
(Specify Year)

	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Quantity per year <u>345 M SCF</u> (Specify Units) Delivered Cost of fuel <u>\$1.06/1000 SCF</u> (\$/Unit Quantity)	Type <u>NONE</u> Quantity per year _____ (Specify Units) Delivered Cost of fuel _____ (\$/Unit Quantity)
PERCENT ASH (Solid Fuel Only) Max. _____ Min. _____ Avg. _____	- - -	
PERCENT SULFUR Max. _____ Min. _____ Avg. _____	less than .02 WT %	
BTU PER UNIT (Specify)	BTU/SCF Max. <u>618</u> Min. <u>373</u> Avg. <u>499</u>	MOL WT <u>10.0</u> <u>5.0</u> <u>7.5</u>

9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL	STANDBY FUEL	MONTH	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>NONE</u> Units _____		Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>NONE</u> Units _____
Jan.	13691		July	14091	
Feb.	14736		Aug.	15487	
March	15636		Sept.	13558	
April	14832		Oct.	12492	
May	15349		Nov.	13787	
June	15297		Dec.	13323	

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units _____	Type <u>NONE</u> Units _____
Maximum	21.3	
Average	19.0	

11. COMBUSTION AIR

☒ NATURAL DRAFT☐ INDUCED☐ FORCED PRESSURE

(lbs./sq.in.)

OTHER

(Specify)

12. STACK DATA

HEIGHT ABOVE GRADE 100
(feet)GAS TEMPERATURE AT EXIT 921
(degrees F. average)INSIDE DIAMETER AT EXIT 3.25
(feet)GAS VELOCITY AT EXIT 34
(feet per sec. average)EXIT GAS FLOW RATE, SCFM: AVERAGE 5586 MAXIMUM 6071ARE SAMPLING PORTS AVAILABLE? Yes ☐ No ☒ (If "Yes" describe)

13. DESCRIBE FUEL TRANSPORT AND STORAGE METHODS:

Fuel gas is pressured thru a pipeline to the furnace. There are no gas storage facilities.

14. IS ANY AIR CONTAMINANT CONTROL DEVICE USED IN CONJUNCTION WITH THIS EQUIPMENT? Yes ☐ No ☒
(If "Yes" a "GAS CLEANING EQUIPMENT," Form AP 109, must be completed and attached.)

15. STACK EMISSIONS:

POLLUTANT	QUANTITY	
	Pounds Per Hour (Average)	Tons Per Year
Particulate	0	0
Sulfur Dioxide	less than .32	less than 1.4
Nitrogen Oxides	E 1.2	5.2
Carbon Monoxide	0	0
Other (Specify)	-	-

BASIS FOR QUANTITIES LISTED ABOVE: O = FUEL GAS ORSAT & FUEL ANALYSIS

E = ESTIMATED FROM AIR POLLUTION ENGINEERING MANUAL
US EPA AP-40 2ND ED

16. IS THIS ITEM IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS? Yes ☒ No ☐
(If "No" a "COMPLIANCE SCHEDULE," Form AP 110 must be completed and attached.)

NAME OF PERSON SUBMITTING REPORT HERBERT E. SIMONS TITLE TECHNICAL SUPT.SIGNATURE Herbert E. SimonsDATE February 25, 1977PHONE 663-7413



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 3, Form AP 100): 6 Ultraformer F1,2,3 & 4
4. EQUIPMENT MANUFACTURER'S INFORMATION:
MANUFACTURER'S NAME BORN ENGINEERING CO RATED CAPACITY - MAXIMUM INPUT 54,300,000
(BTU/hr.)
EQUIPMENT MODEL NUMBER NOT APPLICABLE
5. PURPOSE (If multipurpose, note percent in each use category.)
SPACE HEAT _____ POWER GENERATION _____
PROCESS HEAT 100% OTHER (Specify) _____
6. TYPE OF COMBUSTION UNIT:

<p>A. COAL</p> <p><input type="checkbox"/> PULVERIZED <input type="checkbox"/> SPREADER STOKER</p> <p><input type="checkbox"/> General <input type="checkbox"/> With Fly Ash Reinjection</p> <p><input type="checkbox"/> Dry Bottom <input type="checkbox"/> Without Fly Ash Reinjection</p> <p><input type="checkbox"/> Wet Bottom With Fly Ash Reinjection <input type="checkbox"/> CYCLONE</p> <p><input type="checkbox"/> Wet Bottom Without Fly Ash Reinjection <input type="checkbox"/> HAND FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>	<p>B. BOILER FUEL GAS</p> <p><input type="checkbox"/> HORIZONTALLY FIRED</p> <p><input type="checkbox"/> TANGENTIALLY FIRED</p> <p><input checked="" type="checkbox"/> OTHER (Specify) <u>VERTICALLY</u></p>
---	---
7. NORMAL SCHEDULE OF OPERATION:

HOURS PER DAY <u>24</u>	WEEKS PER YEAR <u>72</u>
DAYS PER WEEK <u>7</u>	PEAK SEASON <u>December, 1976</u>
TOTAL HOURS PER YEAR <u>8760</u>	(Specify Months of Year)

Furnace demand related to severity of reaction and charge rate

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR 1976
(Specify Year)

	PRIMARY FUEL Type <u>GAS</u> Quantity <u>989.7 MMSCF</u> per year (Specify Units) Delivered Cost of fuel <u>\$1.06/1000 SCF</u> (\$/Unit Quantity)	STANDBY FUEL <u>NONE</u> Type _____ Quantity _____ per year (Specify Units) Delivered Cost of fuel _____ (\$/Unit Quantity)
PERCENT ASH (Solid Fuel Only) Max. _____ Min. _____ Avg. _____	- - -	
PERCENT SULFUR Max. _____ Min. _____ Avg. _____	less than .02 Wt %	
BTU PER UNIT (Specify) Max. _____ Min. _____ Avg. _____	BTU/SCF MOL WT 618 10.0 378 5.0 499 7.5	

9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL	STANDBY FUEL	MONTH	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u>	Type <u>NONE</u>		Type <u>GAS</u>	Type <u>NONE</u>
	Units <u>MMBTU</u>	Units _____		Units <u>MMBTU</u>	Units _____
Jan.	41671		July	37354	
Feb.	40777		Aug.	40493	
March	42956		Sept.	38152	
April	38744		Oct.	36878	
May	40842		Nov.	44301	
June	40645		Dec.	51032	

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>NONE</u> Units _____
Maximum	68.6	
Average	56.2	

11. COMBUSTION AIR

☒ NATURAL DRAFT☐ INDUCED☐ FORCED PRESSURE

(lbs./sq.in.)

OTHER

(Specify)

12. STACK DATA

HEIGHT ABOVE GRADE 100
(feet)GAS TEMPERATURE AT EXIT 908
(degrees F. average)INSIDE DIAMETER AT EXIT 7
(feet)GAS VELOCITY AT EXIT 20.8
(feet per sec. average)EXIT GAS FLOW RATE, SCFM: AVERAGE 16,020 MAXIMUM 19,526ARE SAMPLING PORTS AVAILABLE? Yes ☐ No ☒ (If "Yes" describe)

13. DESCRIBE FUEL TRANSPORT AND STORAGE METHODS:

Fuel gas is pressured to furnace via pipeline.
There are no fuel gas storage facilities.

14. IS ANY AIR CONTAMINANT CONTROL DEVICE USED IN CONJUNCTION WITH THIS EQUIPMENT? Yes ☐ No ☒
(If "Yes" a "GAS CLEANING EQUIPMENT," Form AP 109, must be completed and attached.)

15. STACK EMISSIONS:

POLLUTANT	QUANTITY		QUANTITY
	Pounds Per Hour (Average)		Tons Per Year
Particulate	0	0	0
Sulfur Dioxide	0	less than 0.94	less than 4.1
Nitrogen Oxides	E	3.4	14.8
Carbon Monoxide	0	0	0
Other (Specify)	-	-	-

BASIS FOR QUANTITIES LISTED ABOVE: 0 = FLUE GAS ORSAT AND FUEL ANALYSIS.

E = ESTIMATED AIR POLLUTION ENGINEERING MANUAL
US EPA AP-40 2ND ED.

16. IS THIS ITEM IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS? Yes ☐ No ☒
(If "No" a "COMPLIANCE SCHEDULE," Form AP 110 must be completed and attached.)

NAME OF PERSON SUBMITTING REPORT HERBERT E. SIMONS TITLE TECHNICAL SUPT.

SIGNATURE

Herbert E. Simons

DATE February 25, 1977

PHONE 663-7418



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL CO
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 7 Ultraformer Regeneration
4. EQUIPMENT MANUFACTURER'S INFORMATION:

MANUFACTURER'S NAME BORN ENGINEERING CO RATED CAPACITY - MAXIMUM INPUT 1,750,000
(BTU/hr.)

EQUIPMENT MODEL NUMBER NOT APPLICABLE

5. PURPOSE (If multipurpose, note percent in each use category.)

SPACE HEAT _____

POWER GENERATION _____

PROCESS HEAT 100%

OTHER (Specify) _____

6. TYPE OF COMBUSTION UNIT:

A. COAL

☐ PULVERIZED

☐ SPREADER STOKER

☐ General

☐ With Fly Ash
Reinjection

☐ Dry Bottom

☐ Without Fly Ash
Reinjection

☐ Wet Bottom
With Fly Ash
Reinjection

☐ CYCLONE

☐ Wet Bottom
Without Fly Ash
Reinjection

☐ HAND FIRED

☐ OTHER (Specify) _____

B. ~~FUEL OIL~~ FUEL GAS

☐ HORIZONTALLY FIRED

☐ TANGENTIALLY FIRED

☒ OTHER (Specify)

VERTICALLY FIRED

7. NORMAL SCHEDULE OF OPERATION: *

HOURS PER DAY _____

WEEKS PER YEAR _____

DAYS PER WEEK _____

PEAK SEASON _____

TOTAL HOURS PER YEAR 3186

(Specify Months of Year)

- * This furnace (F5) heats air or inert gas during regeneration of Ultraformer reactors. Its operation is intermitant and depends on regeneration requirements.

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR 1976
(Specify Year)

	PRIMARY FUEL	STANDBY FUEL NONE
	Type <u>GAS</u>	Type _____
	Quantity <u>11.17</u> MMSCF per year (Specify Units)	Quantity _____ per year (Specify Units)
	Delivered Cost of fuel <u>\$1.06/1000SCF</u> (\$/Unit Quantity)	Delivered Cost of fuel _____ (\$/Unit Quantity)
PERCENT ASH (Solid Fuel Only)		
Max.	-	
Min.	-	
Avg.	-	
PERCENT SULFUR		
Max.	LESS THAN .02 WT%	
Min.	-	
Avg.	-	
BTU PER UNIT (Specify)	<u>BTU/SCF</u> <u>MOL WT</u>	
Max.	<u>618</u> <u>10.0</u>	
Min.	<u>378</u> <u>5.0</u>	
Avg.	<u>499</u> <u>7.5</u>	

9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL	STANDBY FUEL NONE	MONTH	PRIMARY FUEL	STANDBY FUEL NONE
	Type <u>GAS</u>	Type _____		Type <u>GAS</u>	Type _____
	Units <u>MMBTU</u>	Units _____		Units <u>MMBTU</u>	Units _____
Jan.	158		July	189	
Feb.	0		Aug.	1102	
March	157		Sept.	788	
April	0		Oct.	661	
May	158		Nov.	1229	
June	0		Dec.	1134	

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL NONE
	Type <u>GAS</u> Units <u>MMBTU</u>	Type _____ Units _____
Maximum	1.75	
Average	1.75	



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 101
FUEL BURNING EQUIPMENT USED FOR INDIRECT HEATING

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 8 Alkylation Unit Furnaces
4. EQUIPMENT MANUFACTURER'S INFORMATION:
MANUFACTURER'S NAME FOSTER WHEELER CORP RATED CAPACITY - MAXIMUM INPUT 85,400,000
(BTU/hr.)
EQUIPMENT MODEL NUMBER NOT APPLICABLE
5. PURPOSE (If multipurpose, note percent in each use category.)
SPACE HEAT _____ POWER GENERATION _____
PROCESS HEAT 100% OTHER (Specify) _____
6. TYPE OF COMBUSTION UNIT:

<p>A. COAL</p> <p><input type="checkbox"/> PULVERIZED <input type="checkbox"/> SPREADER STOKER</p> <p><input type="checkbox"/> General <input type="checkbox"/> With Fly Ash Reinjection</p> <p><input type="checkbox"/> Dry Bottom <input type="checkbox"/> Without Fly Ash Reinjection</p> <p><input type="checkbox"/> Wet Bottom With Fly Ash Reinjection <input type="checkbox"/> CYCLONE</p> <p><input type="checkbox"/> Wet Bottom Without Fly Ash Reinjection <input type="checkbox"/> HAND FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>	<p>B. FUEL OIL</p> <p><input checked="" type="checkbox"/> HORIZONTALLY FIRED</p> <p><input type="checkbox"/> TANGENTIALLY FIRED</p> <p><input type="checkbox"/> OTHER (Specify) _____</p>
<p>C. FUEL GAS</p> <p><input checked="" type="checkbox"/> OTHER (Specify) <u>VERTICALLY FIRED</u></p>	
7. NORMAL SCHEDULE OF OPERATION:
HOURS PER DAY 24 WEEKS PER YEAR 52
DAYS PER WEEK 7 * PEAK SEASON Jan. Feb. March.
TOTAL HOURS PER YEAR 8760 (Specify Months of Year)

* Furnace demand more related to unit charge rate than to season of the year

8. TYPE AND QUANTITY OF FUEL USED FOR LAST CALENDAR YEAR 1976
(Specify Year)

	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u>	Type <u>OIL</u> *
	Quantity per year <u>972 MM SCF</u> (Specify Units)	Quantity per year <u>1490 Bbl</u> (Specify Units)
	Delivered Cost of fuel <u>\$1.38/1000 SCF</u> (\$/Unit Quantity)	Delivered Cost of fuel <u>\$9.22/Bbl</u> (\$/Unit Quantity)
PERCENT ASH (Solid Fuel Only)		
Max.	-	-
Min.	-	-
Avg.	-	0
PERCENT SULFUR		
Max.	Wt % 3.56	-
Min.	3.34	-
Avg.	1.95	0
BTU PER UNIT (Specify)	BTU/SCF	MOL WT
Max.	775	18.1
Min.	525	8.5
Avg.	651	13.3
	MM BTU/Bbl	GRAVITY
	-	-
	-	-
	4.35	22.3°API

* ACID SOLUBLE OIL, A BY PRODUCT OF CATALYST (HF) REGENERATION .
9. MONTHLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

QUANTITY			QUANTITY		
MONTH	PRIMARY FUEL	STANDBY FUEL	MONTH	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>OIL</u> Units <u>MMBTU</u>		Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>OIL</u> Units <u>MMBTU</u>
Jan.	64,009	498	July	47,771	517
Feb.	62,612	593	Aug.	48,728	602
March	62,325	612	Sept.	39,903	459
April	53,753	536	Oct.	43,351	445
May	53,226	478	Nov.	51,896	574
June	47,497	538	Dec.	57,808	632

10. HOURLY FUEL USE FOR LAST CALENDAR YEAR 1976
(Specify Year)

	QUANTITY	
	PRIMARY FUEL	STANDBY FUEL
	Type <u>GAS</u> Units <u>MMBTU</u>	Type <u>OIL</u> Units <u>MMBTU</u>
Maximum	<u>90</u>	<u>.85</u>
Average	<u>72</u>	<u>.74</u>

11. COMBUSTION AIR

☒ NATURAL DRAFT☐ INDUCED☐ FORCED PRESSURE

(lbs./sq.in.)

OTHER

(Specify)

12. STACK DATA

HEIGHT ABOVE GRADE 175
(feet)GAS TEMPERATURE AT EXIT 744
(degrees F. average)INSIDE DIAMETER AT EXIT 6.5
(feet)GAS VELOCITY AT EXIT 26.3
(feet per sec. average)EXIT GAS FLOW RATE, SCFM: AVERAGE 20,087 MAXIMUM 25,091ARE SAMPLING PORTS AVAILABLE? Yes ☐ No ☒ (If "Yes" describe)

13. DESCRIBE FUEL TRANSPORT AND STORAGE METHODS:

The by product oil is pressured directly to the furnace periodically via pipeline as it accumulates. No storage is used.

Gas is pressured via pipeline to the furnace.
No storage is available.

14. IS ANY AIR CONTAMINANT CONTROL DEVICE USED IN CONJUNCTION WITH THIS EQUIPMENT? Yes ☐ No ☒
(If "Yes" a "GAS CLEANING EQUIPMENT," Form AP 109, must be completed and attached.)

15. STACK EMISSIONS:

POLLUTANT	QUANTITY	
	Pounds Per Hour (Average)	Tons Per Year
Particulate	O 0	0
Sulfur Dioxide	O 160	702
Nitrogen Oxides	E 4.6	20
Carbon Monoxide	O 0	0
Hydrofluoric Other acid	O 12	52

BASIS FOR QUANTITIES LISTED ABOVE: O = ORSAT & FUEL ANALYSIS

E = ESTIMATED AIR POLLUTION ENGINEERING MANUAL
US EPA AP-40 2ND ED.

16. IS THIS ITEM IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS? Yes ☒ No ☐
(If "No" a "COMPLIANCE SCHEDULE," Form AP 110 must be completed and attached.)

NAME OF PERSON SUBMITTING REPORT HERBERT E. SIMONS TITLE TECHNICAL SUPT.SIGNATURE Herbert E. SimonsDATE March 14, 1977PHONE 663-7418



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 102
MANUFACTURING OR PROCESSING EQUIPMENT

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100) 9 FCU
4. TYPE OF UNIT OR PROCESS (e.g. rotary drier, cupola furnace, crusher, pelletizer, etc.):
FLUID CATALYTIC CRACKING UNIT
Constructed By MAKE THE LUMMUS CO MODEL NOT APPLICABLE DATE INSTALLED Sept. 1, 1954
CAPACITY (manufacturer's or designer's guaranteed maximum) 12,500 BSD
OPERATING CAPACITY (specify units) 23,000 BSD

BRIEFLY DESCRIBE THE OPERATION OF THIS UNIT OR PROCESS IN YOUR FACILITY:

This unit converts the heavy fractions (atmospheric distillation bottoms) of crude to light oils, mainly gasoline components and distillate fuel components.

5. NORMAL OPERATING SCHEDULE:
Hours per day 24 Days per week 7 Weeks per year 52
Hours per year 8760 Peak production season (if any) Production not seasonal
Dates of annually occurring shut down of operations The unit is not shut down annually
6. RAW MATERIALS INTRODUCED INTO UNIT OR PROCESS (Including solid fuels):

Material	Hourly Process Weight Rate Pounds Per Hour			1976 Annual Average Quantity (Specify Units)	Intermittent Operation Only: Average Hours/week
	Average	Maximum	Design		
Reduced Crude	266,787	309,936	163,000	899 Bbl/hr	-

7. PRODUCTS OF UNIT OR PROCESS:

Material	Hourly Process Weight Rate Pounds Per Hour			Annual Average Quantity (Specify Units)	Intermittent Operation Only: Average Hours/week
	Average	Maximum	Design		
Dry Gas	7120	9669	5442	209 MSCF/Hr	-
C ₃ - C ₄	32,119	38,797	24,542	197 Bbl/Hr	-
DIN	32,139	43,983	14,373	152 Bbl/Hr	-

7. PRODUCTS OF UNIT OR PROCESS: (Continued)

Material	Hourly Process Weight Rate Pounds per Hour			1976 Annual Average Quantity (Specify Units)	Intermittent Operation (Average Hours/week)
	Average	Maximum	Design		
SHN	69,881	106,263	49,176	310 Bbl/Hr	-
MCCO	85,597	105,544	50,140	264 Bbl/Hr	-
DO	23,470	34,575	7,820	68 Bbl/Hr	-
COKE	16,461	18,783	11,000	17.21 M lb/Hr	-

DEFINITIONS

Reduced Crude	= Bottoms from atmospheric distillation of Crude Oil.
Dry Gas	= Ethane and lighter material contains small % of Propane.
C ₃ - C ₄	= Mixture of Propane, Propene, Butane and Butene.
DLN	= Debutanized Light Naphtha.
SHN	= Stabilized Heavy Naphtha.
MCCO	= Medium Catalytic Cycle Oil.
DO	= Decanted Oil.
Coke	= Carbon with about 7.5 Wt. % hydrogen. Coke is deposited on the catalyst during the cracking reaction and burned off the catalyst in the regenerator thus regenerating the catalyst and providing the heat necessary for the cracking reaction.

8. FUELS USED (excluding heat supplied by indirect heat exchangers):

Coal _____ tons/yr. Percent sulfur _____ Percent ash _____

Oil _____ gal/yr. Percent sulfur _____ Grade No. _____

Natural gas _____ Thousand cu. ft./yr. L.P. gas _____ gal./yr.

Coke 75379 Ton/yr, percent Sulfur 3.3 wt.%. By product Coke, burned
Other (Specify) regenerator, provides heat for process and regenerates catalyst.

9. USING A FLOW DIAGRAM: (1) Illustrate input of raw materials, (2) label production processes, process fuel combustion, process equipment, and air pollution control equipment, (3) illustrate locations of air contaminant release so that emission points under Item 10 can be identified. Attach extra pages as needed. See attached drawings A492 & A493

10. EMISSIONS TO THE ATMOSPHERE (each point of emission should be listed separately and numbered so that it can be located on the flow sheet):

Emission Point	Stack Height (ft.)	Stack Diameter (ft. at top)	Gas Dis- charged (SCFM)	Exit Temp. (°F.)	Gas Velocity (FPS)
I	181.5	8.67	49990	850	43.

11. AIR CONTAMINANTS EMITTED:

Emission Point	Pollutant	Amount		Basis of Estimate
		Pounds Per Hour	Tons Per Year	
I	CO	14,986	65,640	Coke Burn & Orsat
	SO ₂	1,136	4,975	Analysis of Coke
	Particulate	72	315	Catalyst Addition Rate

12. ARE ANY VOLATILE ORGANIC COMPOUNDS STORED ON PREMISES? ☐ YES ☒ NO

Material Stored	Size of Tank (gallons)	Vapor Control Devices

13. ARE ANY ORGANIC SOLVENTS USED OR PRODUCED? ☐ YES ☒ NO

Type	Principal Use	Quantity Per Year (gallons)	
		Consumed	Produced

14. IS THERE ANY EMISSION CONTROL EQUIPMENT ON THIS UNIT OR PROCESS? ☒ Yes ☐ No
Where a gas cleaning device exists, a "GAS CLEANING EQUIPMENT", Form AP 109 must be completed and attached.

15. IS THIS UNIT OR PROCESS IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

☒ Yes ☐ No

(If "No," a "Compliance Schedule", Form AP 110 must be completed and attached)

16. DOES THE INPUT MATERIAL OR PRODUCT FROM THIS PROCESS OR UNIT CONTAIN FINELY DIVIDED MATERIALS WHICH COULD BECOME AIRBORNE? ☐ Yes ☒ No
The input material and products are Hydrocarbons - The catalyst is finely divided material
Describe Storage Methods Used:

Catalyst: Stored in two cone bottom 12'6" ID x 55' long closed vessels

Stored in two cone bottom pressure vessels, one 12'6" ID x 69'7" and the other 15'6" x 72'10".

LIST STORAGE PILES (if any) None

Type of Material	Particle Size (Average diameter or screen size)	Pile Size (average tons on pile)	Pile Wetted (Yes or No)	Pile Covered (Yes or No)
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

NAME OF PERSON SUBMITTING REPORT HERBERT E. SIMONS TITLE TECHNICAL SUPERINTENDENT

SIGNATURE Herbert E. Simons

DATE 2-28-77

PHONE 663-7418



NORTH DAKOTA STATE DEPARTMENT OF HEALTH
Air Pollution Control Program
State Capitol
Bismarck, North Dakota - 58501

PERMIT APPLICATION
FORM AP 109
GAS CLEANING EQUIPMENT

1. NAME OF FIRM OR ORGANIZATION: AMOCO OIL COMPANY
2. PLANT LOCATION: NORTH OF THE CITY OF MANDAN, ND
3. SOURCE IDENTIFICATION NUMBER (From Item 9, Form AP 100): 9 FCU Cyclones
4. TYPE OF GAS CLEANING EQUIPMENT ☐ CYCLONE ☐ MULTICLONE ☐ BAG FILTER
☐ ELECTROSTATIC PRECIPITATOR ☐ WET SCRUBBER
☒ OTHER (Describe) Two Stage Cyclones
5. NAME OF MANUFACTURER: Buell Engineering Co Inc
MODEL NO. 1st Stage 8 No 40 AC 3508 2nd Stage 8 No 38 AC 430 DATE INSTALLED May 1967
6. APPLICATION (e.g., boiler, kiln) Fluid Catalytic Cracking Unit
7. POLLUTANTS REMOVED: Particulates
DESIGN EFFICIENCY 99.992 %
OPERATING EFFICIENCY 99.996 %
DESCRIBE METHOD USED IN DETERMINING OPERATING EFFICIENCY:
Average catalyst flow to regenerator (1976) 13.2 Ton/Min
Average catalyst loss to atmosphere (1976) 0.83 Ton/Day
(cat losses from cat material balance)
100 - (100)(0.83) / (13.2)(60)(24) = 99.996%
8. GAS CONDITIONS: (Design)

	INLET	OUTLET
GAS VOLUME (SCFM 60°F., 14.7 psia)	<u>48,840</u>	<u>50.946</u>
GAS TEMPERATURE (°F.)	<u>1,225</u>	<u>1,280</u>
GAS PRESSURE (in. H ₂ O)	<u>512.5</u>	<u>484.8</u>
GAS VELOCITY (ft./sec.)	<u>64.4</u>	<u>67.8</u>
POLLUTANT CONCENTRATION <u>Particulates</u> (Specify pollutant and units of concentration)	<u>0.52 lb/SCF</u>	<u>.000041 lb/SCF</u>
9. PRESSURE DROP THROUGH GAS CLEANING DEVICE 27.7 in. H₂O.

10. PROVIDE A BRIEF DESCRIPTION AND SKETCH OF THE GAS CLEANING DEVICE IF IT IS OF UNUSUAL DESIGN OR USED IN CONJUNCTION WITH OTHER CONTROL DEVICES. SHOW ANY BYPASS OF THE DEVICE, AND SPECIFY THE CONDITIONS UNDER WHICH THE BYPASS IS USED. ATTACH EXTRA PAGES AS NEEDED.

See attached specifications for design
and Buell Engineering Co drawing 06480R-06

11. DESCRIBE COLLECTED AIR CONTAMINANTS DISPOSAL AND/OR TRANSPORTATION METHODS.

Collected air contaminants are returned to the process.

12. IF A STACK TEST HAS BEEN CONDUCTED A COPY OF THE RESULTS, DATE OF THE TEST, A DESCRIPTION OF THE TECHNIQUES USED AND THE NAME AND ADDRESS OF THE ORGANIZATION PERFORMING THE TEST MUST BE ENCLOSED. (No stack test has been conducted. The catalyst losses are determined by catalyst material balances)

NAME OF PERSON SUBMITTING APPLICATION H. E. Simons TITLE Technical Superintendent

SIGNATURE Robert E. Simons

DATE 4-6-77

PHONE 663-7418

Attachment 2

24 Hour Calculation for October 20, 1976				
Source	Basis*	Energy: MMBTU/Day	Lbs SO ₂ /MMBTU	Emissions LBs/ Day
Boilers - Gas	BTUs for Day @ Annual Average Gas Properties	2693	1.64	4400
Boilers - Oil	BTUs for Day @ Month's Average Oil Properties	4616	2.04	9400
Crude Furnace - Gas	BTUs for Month @ Annual Average Properties	2175	5.47	11900
Crude Furnace - Oil	BTUs for Month @ Month's Average Properties	1128	2.04	2300
Ultraformer Furnaces	BTUs for Month @ Average Properties	1614	0.17	270
Alkylation Unit B-1 and B-2 Furnaces	BTUs for Month @ Annual Average Properties	1398	2.1	2900
		Coke: MLbs/Day	Lbs SO ₂ / MLbs Coke	
FCC Unit	Coke Burn for Day @ Annual Average Wt% S	451	66	29800
Total Sulfur Dioxide Emissions				60970

* See Attachment 3 for calculation of emission factors.

** Representative of High FCU Operations for 1976.

1977 Sulfur Dioxide Emission Factors

Factors used to calculate 24 hour maximum sulfur dioxide emissions.

Boiler Gas

Based on Yearly Average Hydrogen Sulfide Content and Heat of Combustion (page 7 of 60 in APCPA))
(No gas chromatography data could be located for October. Data for September and November indicates the annual data is representative of the hydrogen sulfide concentration.)

Volume % H₂S:

$$\frac{1.43 \text{ Lbs S}}{32 \text{ Lbs S/Lb Mole S}} \div \frac{100 \text{ Lbs Gas}}{19.3 \text{ Lbs Gas/Lb Mole}} \times \frac{1 \text{ Lb Mole H}_2\text{S}}{1 \text{ Lb Mole S}} \times 100\% = 0.862 \% \text{ H}_2\text{S}$$

SO₂ Emission Factor:

$$\frac{0.862 \text{ SCF H}_2\text{S}}{100 \text{ SCF Gas}} \times \frac{1 \text{ SCF Gas}}{890 \text{ BTU}} \times \frac{1 \text{ Lb Mole H}_2\text{S}}{379 \text{ SCF}} \times \frac{1 \text{ Lb Mole SO}_2}{1 \text{ Lb Mole H}_2\text{S}}$$

$$\frac{64 \text{ Lbs SO}_2}{\text{Lb Mole}} \times \frac{10^6}{\text{MM}} = 1.64 \frac{\text{Lbs SO}_2}{\text{MM BTU}}$$

Boiler Fuel Oil

Based on October Average Sulfur Content and Heat of Combustion (back-up to APCPA))

Fuel Oil Properties

9.03 API Gravity
17260 BTU/Lb
8.386 Lb/Gallon
1.76 Wt % Sulfur
6,080,000 BTU/Barrel

$$\frac{1.76 \text{ Lb S}}{100 \text{ Lb Fuel Oil}} \times \frac{1 \text{ Lb Fuel Oil}}{17260 \text{ BTU}} \times \frac{1 \text{ Lb Mole S}}{32 \text{ LBS S}} \times \frac{1 \text{ Lb Mole SO}_2}{1 \text{ Lb Mole SO}_2}$$

$$\frac{64 \text{ Lbs SO}_2}{1 \text{ Lb Mole S}} \times \frac{10^6}{\text{MM}} = 2.04 \frac{\text{LBS SO}_2}{\text{MMBTU}}$$

Crude Furnace Gas

Based on Yearly Average Hydrogen Sulfide Content and Heat of Combustion (page 16 of 60 in APCPA))
(Includes the Gebitol Acid Gas)

Volume % H₂S:

$$\frac{4.25 \text{ Lbs S}}{32 \text{ Lbs S/Lb Mole S}} \div \frac{100 \text{ Lbs Gas}}{20.3 \text{ Lbs Gas/Lb Mole}} \times \frac{1 \text{ Lb Mole H}_2\text{S}}{1 \text{ Lb Mole S}} \times 100\% = 2.70 \% \text{ H}_2\text{S}$$

SO₂ Emission Factor:

$$\frac{2.70 \text{ SCF H}_2\text{S}}{100 \text{ SCF Gas}} \times \frac{1 \text{ SCF Gas}}{834 \text{ BTU}} \times \frac{1 \text{ Lb Mole H}_2\text{S}}{379 \text{ SCF}} \times \frac{1 \text{ Lb Mole SO}_2}{1 \text{ Lb Mole H}_2\text{S}} \times \frac{64 \text{ Lbs SO}_2}{\text{Lb Mole}} \times \frac{10^6}{\text{MM}} = 5.47 \frac{\text{Lbs SO}_2}{\text{MM BTU}}$$

Alkylation Unit Furnace Gas

Based on Yearly Average Hydrogen Sulfide Content and Heat of Combustion (page 28 of 60 in APCPA))

Volume % H₂S:

$$\frac{1.95 \text{ Lbs S}}{32 \text{ Lbs S/Lb Mole S}} / \frac{100 \text{ Lbs Gas}}{13.3 \text{ Lbs Gas/Lb Mole}} \times \frac{1 \text{ Lb Mole H}_2\text{S}}{1 \text{ Lb Mole S}} \times 100\% = 0.810 \% \text{ H}_2\text{S}$$

SO₂ Emission Factor:

$$\frac{0.810 \text{ SCF H}_2\text{S}}{100 \text{ SCF Gas}} \times \frac{1 \text{ SCF Gas}}{651 \text{ BTU}} \times \frac{1 \text{ Lb Mole H}_2\text{S}}{379 \text{ SCF}} \times \frac{1 \text{ Lb Mole SO}_2}{1 \text{ Lb Mole H}_2\text{S}} \times \frac{64 \text{ Lbs SO}_2}{\text{Lb Mole}} \times \frac{10^6}{\text{MM}} = 2.10 \frac{\text{Lbs SO}_2}{\text{MM BTU}}$$

Ultraformer Unit Furnace Gas

Based on Yearly Average Heat of Combustion (page 19 of 60 in APCPA))

Hydrogen Sulfide Content adjusted to 500 ppmv based on Ultraformer sulfur balance.

SO₂ Emission Factor:

$$\frac{0.05 \text{ SCF H}_2\text{S}}{100 \text{ SCF Gas}} \times \frac{1 \text{ SCF Gas}}{499 \text{ BTU}} \times \frac{1 \text{ Lb Mole H}_2\text{S}}{379 \text{ SCF}} \times \frac{1 \text{ Lb Mole SO}_2}{1 \text{ Lb Mole H}_2\text{S}} \times \frac{64 \text{ Lbs SO}_2}{\text{Lb Mole}} \times \frac{10^6}{\text{MM}} = 0.17 \frac{\text{Lbs SO}_2}{\text{MM BTU}}$$

FCU Coke

Based on Average of 3.3 Wt% Sulfur in Coke (page 32 of 60 in APCPA))

SO₂ Emission Factor:

$$\frac{3.3 \text{ Lbs S}}{100 \text{ Lbs Coke}} \times \frac{64 \text{ Lbs SO}_2}{32 \text{ Lb S}} \times \frac{1000 \text{ Lbs Cok}}{\text{M Lbs Coke}} = 66.0 \frac{\text{Lbs SO}_2}{\text{MLbs Coke}}$$